



Environmental Program Information

Introduction

LLNL is committed to operating in a manner that preserves the quality of the environment. The Environmental Protection Department (EPD) leads this effort in the areas of environmental compliance and accountability. This chapter begins with a description of LLNL's integrated Environmental, Safety, and Health (ES&H) Management System, continues with the development of Work Smart Standards and missions, and describes activities of EPD and its three divisions. Performance measures (PMs) used by DOE to evaluate the Laboratory's environmental protection efforts are then summarized. The bulk of the chapter is devoted to an account of LLNL's activities and progress in waste minimization and pollution prevention in 1996. Following descriptions of current issues and actions in the environmental programs arena, this chapter concludes with a brief discussion of spill response and EPD environmental training.

Integrated Environmental, Safety, and Health Management System

The ES&H Program at LLNL employs a process of assessing hazards and the environmental implications of our work; designing and implementing standards-based methods intended to control risks; and complying with the applicable ES&H regulations. This process is implemented using a graded approach, which increases the level of risk management as the hazard increases. An overview of the Laboratory's ES&H Program and a general description of how the Laboratory manages ES&H activities can be found in *The Environmental, Safety, and Health Program at Lawrence Livermore National Laboratory* (LLNL 1996g).

On October 15, 1996, the Department of Energy issued DOE Policy 450.4: Safety Management System Policy. This policy provides a formal, organized process whereby employees plan, assess, and improve safety in their work. In this policy statement the term "safety" is used comprehensively to include environment and health. The policy was developed taking into consideration various consensus management standards such as International Standards Organization (ISO) 14000, Voluntary Protection Program (VPP), and Recommendation 95-2 from the Defense Nuclear Facility Safety Board. Embracing ISO 14000 by using the major components of the standard, while not



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adopting it in total, allows flexibility in various management systems while not requiring adoption of a standard for adoption's sake. This policy lets the field of ISO 14000 develop such that if documented cost benefits can be demonstrated (in a command and control environment), a facility could elect to utilize the standard in total by implementing an integrated safety management system (ISMS). Integrated ES&H management systems are defined as having five functions: to define the scope of work, analyze hazards, develop and implement standards-based controls, perform work, and provide feedback and improvement. The current LLNL ES&H management process reflects requirements of these five functions. Therefore, to satisfy the DOE's ISMS requirement, LLNL's primary task will be to update our guidance documents and formalize the standard set through the Work Smart Standard Closure Process. Additionally, documentation of our ES&H management system will be updated to reflect the concepts defined in ISMS. Implementation of a fully documented ISMS is scheduled to begin in 1998.

Work Smart Standards

Work Smart Standards (WSS) will improve both safety and the working relationship between the DOE and its contractors and is expected to become part of the DOE contract with the University of California. DOE made the Safety Management System both a policy (DOE Policy 450.4) and an acquisition regulation (Clause 970.5204-2). Implementation of the ISMS at LLNL will take 2 years, but the WSS will be completed in fiscal year 1997.

The WSS process (DOE M450.3-1) requires an understanding of the work, an analysis of the hazards associated with the work, and the selection of standards from which hazards controls are developed to minimize the hazards. LLNL has traditionally identified and controlled hazards to protect the worker, the public, and the environment, but WSS differs from the past in that responsibility for selection of appropriate and necessary standards is in the hands of both the DOE field office and the contractor. This process empowers LLNL and local DOE staffs, through consensus, to focus on the work being performed and to select sitewide ES&H standards that are based on the actual work being conducted, not on compliance with generalized requirements.

Standards are approved at the management level closest to the work. Others cannot approve the set, require concurrence, or second-guess the standards selected. The LLNL Director and DOE Oakland Operations Office Manager will approve the final set of sitewide standards. This action will align LLNL with industry practice, establish



common ES&H expectations for the DOE and UC, help LLNL meet DOE's commitment to the Defense Nuclear Facility Safety Board, and facilitate the tailoring of requirements to streamline and increase the effectiveness of ES&H management at LLNL. Existing ES&H methodologies and documentation will support the completion of the process.

Environmental Protection Department

As the Laboratory's environmental support organization, EPD prepares and maintains environmental plans and guidelines, provides environmental guidance and support to Laboratory personnel, informs management about pending changes in environmental regulations pertinent to LLNL, represents the Laboratory in day-to-day interactions with regulatory agencies, and assesses the effectiveness of pollution control programs.

EPD monitors air, water, soil, and foodstuffs; evaluates possible contaminant sources; and models the impact of LLNL operations on humans and the environment. In 1996, 20,343 samples were taken from air, sewage, ground water, surface water, soil, sediments, vegetation, and foodstuffs. More than 310,292 analytes were tested. These numbers represent increases of 9% and 25%, respectively, compared to 1995 values. The type of samples collected at a specific location depends on the site and the potential pollutants to be monitored; see the specific chapters of this report for discussions of each environmental medium.

A principal part of EPD's mission is to work with LLNL programs to ensure that operations are conducted in a manner that limits environmental impacts and is in compliance with regulatory guidelines. EPD helps LLNL programs manage and minimize hazardous, radioactive, and mixed wastes; determines the concentrations of environmental contaminants remaining from past activities; cleans up environmental contamination to acceptable standards; responds to emergencies in order to minimize and assess any impact on the environment and the public; and provides training programs to improve the ability of LLNL employees to comply with environmental regulations.

LLNL programs are supported by EPD's four Environmental Support Teams (ESTs). The ESTs are integrated into the Environmental Safety and Health Teams (ES&H Teams) at the Laboratory through the Environmental Analyst who chairs the ESTs. Each EST includes representatives from environmental specialties within the Operations and Regulatory Affairs Division (ORAD), along with a field technician from the Hazardous Waste Management (HWM) Division. Some ESTs also include a representative from the Environmental Restoration Division (ERD), the ES&H Teams, or the organizations



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supported by the ESTs. These teams evaluate operations, determine potential environmental impacts, and provide guidance on environmental regulations and DOE orders for existing and proposed projects. ESTs assist programs in planning, implementing, and operating projects and in understanding and meeting their environmental obligations. When permits are obtained from regulatory agencies, ESTs aid the program in evaluating the permit conditions and implementing recordkeeping requirements.

The four Environmental Support Teams (ESTs) assist LLNL programs with environmental issues through the appropriate ES&H team. Each EST consists of individuals specializing in specific environmental disciplines such as the National Environmental Policy Act (NEPA), permits, pollution prevention, or waste management. Support is available either directly from the EST discipline or through the ES&H team environmental analysts. Environmental analysts serve as liaisons between the ESTs and ES&H teams.

Operations and Regulatory Affairs Division

ORAD currently consists of eight groups that specialize in environmental compliance and monitoring and provide laboratory programs with a wide range of information, data, and guidance to make more informed environmental decisions.

ORAD prepares the environmental permit applications and related documents for submittal to federal, state, and local agencies and provides the liaison between LLNL and regulatory agencies conducting inspections; tracks chemical inventories; prepares National Environmental Policy Act (NEPA) documents and conducts related field studies for DOE; oversees wetland protection and floodplain management requirements; coordinates cultural and wildlife resource protection and management; facilitates and provides support for the pollution prevention and recycling programs; teaches numerous environmental training courses; coordinates the tank environmental compliance program; conducts compliance and surveillance monitoring; and provides environmental impact modeling and analysis, risk assessment, and reporting.

ORAD also actively assists in responding to environmental emergencies such as spills. During normal working hours, an Environmental Analyst from the ORAD Environmental Operations Group responds to environmental emergencies and notifies a specially trained Environmental Duty Officer (EDO). EDOs are on duty 24 hours a day and coordinate with LLNL's ES&H Team and other first responders or environmental specialists.



Hazardous Waste Management Division

All hazardous, radioactive, and mixed wastes generated at LLNL facilities are managed by the Hazardous Waste Management (HWM) Division in accordance with state and federal requirements. HWM processes, stores, packages, solidifies, treats, and prepares waste for shipment and disposal, recycling, or discharge to the sanitary sewer.

As part of its waste management activities, HWM tracks and documents the movement of hazardous, mixed, and radioactive wastes from waste accumulation areas (WAAs) located near the waste generator to final disposition; develops and implements approved standard operating procedures; decontaminates LLNL equipment; ensures that containers for shipment of waste meet the specifications of the U.S. Department of Transportation (DOT) and other regulatory agencies; responds to emergencies; and participates in the cleanup of potential hazardous and radioactive spills at LLNL facilities. HWM prepares numerous reports, including the annual and biennial hazardous waste reports required by the state and federal environmental protection agencies. HWM also prepares waste acceptance criteria documents, safety analysis reports, and various waste guidance and management plans.

HWM meets regulations requiring the treatment and disposal of LLNL's mixed waste in accordance with the requirements of the Federal Facility Compliance Act. The schedule for this treatment is negotiated with the State of California and involves developing new on-site treatment options, as well as finding off-site alternatives.

HWM is responsible for implementing a program directed at eliminating the backlog of Legacy Waste (waste that is not presently certified for disposal). This effort includes a large characterization effort to identify all components of the waste, as well as a certification effort, which will provide the disposal site with appropriate documentation.

Environmental Restoration Division

The Environmental Restoration Division (ERD) was established to evaluate and remediate contaminated soil and ground water resulting from past hazardous materials handling and disposal and from leaks and spills that have occurred at the Livermore site and Site 300, both prior to and during LLNL operations. At both the Livermore site and Site 300, ERD investigates field sites to characterize the existence, extent, and impact of contamination. ERD evaluates and develops various remediation technologies, makes recommendations, and implements actions for site restoration. ERD is responsible for managing remedial activities, such as soil removal and ground water extraction, and for assisting in closing inactive facilities in a manner designed to prevent environmental contamination.



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In dealing with CERCLA compliance issues, ERD plans, directs, and conducts assessments to determine both the impact of such releases on the environment and the restoration activities needed to reduce contaminant concentrations to protect human health and the environment. ERD is responsible for interacting with the community on these issues. Several public meetings are held each year as required in the ERD CERCLA Community Relations Plans. To comply with CERCLA ground water remedial actions at the Livermore site, ERD designed and constructed six ground water treatment facilities and associated pipeline networks and wells (see Chapters 7 and 8). At Site 300, ERD designed and implemented two soil vapor/ground water extraction and treatment systems and one ground water extraction and treatment system. ERD also capped two inactive mixed-waste landfills. ERD is actively designing, testing, and applying innovative remediation and assessment technologies to contaminant problems at the Livermore site and Site 300. ERD also provides the sampling and data management support for ground water surveillance and compliance monitoring activities.

Performance Measures Summary

Since 1992, the contract for the University of California to manage and operate LLNL for DOE has contained Performance Objectives, Criteria, and Measures. Six of these Performance measures evaluated LLNL's environmental protection activities in 1996. The status of these measures is described in this report at the location referenced in **Table 3-1**.

In their evaluation of LLNL's fiscal year 1996 self-assessment, DOE and UC reported that LLNL met or exceeded all of the environmental performance measures for the reporting period. Data for calendar year 1996 will be included in the annual self-assessment and evaluation conducted August through October 1997.

DOE Pollution Prevention Goals

The Secretary of Energy has committed the Department to the following Pollution Prevention (P2) goals, which are to be achieved throughout the complex by December 31, 1999, using 1993 as a baseline:

1. Reduce total releases and off-site transfers for treatment and disposal of Emergency Planning and Community Right-to-Know Act (EPCRA) 313 toxic chemicals from routine operations by 50%.
2. Reduce the generation of radioactive waste from routine operations by 50%.



3. Reduce the generation of low-level mixed waste from routine operations by 50%.
4. Reduce the generation of hazardous waste from routine operations by 50%.
5. Reduce the generation of sanitary waste (after recycling) from routine operations by 33%.
6. Divert 33% of sanitary waste from all operations for recycling.
7. Increase the affirmative procurement of Environmental Protection Agency (EPA)-designated recycled products to 100%.

Table 3-1. DOE environmental protection performance measures.

P.M. designator	Performance measure	Location in this report
1.1.b	<p>Radiation Protection of the Public</p> <p>Public radiation doses to the maximally exposed individual from DOE operations will be measured or calculated and controlled to assure that applicable federal limits are not exceeded. An effective ALARA (as low as reasonably achievable) program shall be in place to manage dose to the public.</p>	<p>Chapter 12: Radiological Dose Assessment; section on Radiological Doses from Air Emissions.</p> <p>Chapter 2: National Emission Standards for Hazardous Air Pollutants.</p>
1.2.a	<p>Waste Reduction and Recycling</p> <p>The Laboratory continues to progress towards meeting the DOE's pollution prevention goals for the year 2000.</p>	This chapter, section on Waste Minimization/Pollution Prevention.
1.2.b	<p>Pollution Prevention</p> <p>The Laboratory continues to survey on-site operations for opportunities to reduce waste and pollutant releases to all media. Specific opportunities are identified, and success in project implementation and achievement of the agreed-to waste or pollutant reduction project goal(s) are tracked.</p>	This chapter, section on Waste Minimization/Pollution Prevention.
2.1.a	<p>Tracking and Trending of Environmental Findings and Violations</p> <p>The number of validated environmental violations and findings resulting from inspections by regulatory agencies and formal audits will be tracked and trended. A downward trend is expected for each category from the 1993 base year.</p>	Chapter 2: Compliance Summary, Table 2-8 .
2.1.b	<p>Tracking and Trending of Environmental Releases</p> <p>Reportable occurrences of environmental releases exceeding regulatory or permitted levels imposed by local, state or federal agencies will be determined and trended. A downward trend is expected. Changes in regulatory procedures after the 1993 base year that increase or decrease the level of occurrence reporting shall be brought to the attention of UC and DOE as soon as possible and adjustments made to the base year figure, as appropriate.</p>	Chapter 2: Compliance Summary, Table 2-9, Table 2-12 .
5.1.a	<p>External Customers</p> <p>The Laboratory measures and evaluates the environment, safety and health expectations of its external customers and incorporates the input into Laboratory programs as appropriate.</p>	<p>This chapter.</p> <p>Chapter 2: Compliance Summary, section on CERCLA/SARA, Title I.</p>



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Progress toward achieving these goals is reported annually to the Secretary of Energy in LLNL's *Annual Report on Waste Generation and Waste Minimization Progress*.

The DOE's *Pollution Prevention Program Plan 1996* (U.S. Department of Energy 1996b) establishes six immediate priorities, due to be implemented by fiscal year 1998, which will help DOE Headquarters, the Operations Offices, and the sites focus resources on the most critical aspects of DOE's P2 program.

The six priorities are to:

1. Establish senior management commitment to P2 implementation.
2. Set quantitative, site-specific waste reduction and recycling goals.
3. Institute performance measures.
4. Implement cost-saving P2 projects.
5. Design P2 into new products, processes, and facilities.
6. Ensure that site programs comply with federal, state, and DOE requirements.

LLNL prepares a P2 Plan, which meets the requirements of (1) DOE Orders 5820.2A and 5400.1; (2) RCRA, Sections 3002(b) and 3005(h); and (3) Title 22 of the California Code of Regulations. This Plan is reviewed annually and updated every 3 years; it was last updated and submitted to the DOE in May 1997 (Celeste 1997). The Plan reviews past and current pollution prevention activities and states the objectives of LLNL's waste minimization and pollution prevention efforts.

The P2 Program at LLNL is an organized, comprehensive, and continuing effort to systematically reduce solid, hazardous, radioactive, and mixed waste generation. The P2 Program is designed to eliminate or minimize pollutant releases to all environmental media from all aspects of the site's operations. These efforts offer increased protection of public health and the environment by reducing or eliminating waste management and compliance costs, resource usage, inventories and releases of hazardous chemicals, and civil and criminal liabilities under environmental laws.

In accordance with EPA guidelines and DOE policy, a hierarchical approach to waste reduction (i.e., source elimination or reduction, material substitution, reuse and recycling, and treatment and disposal) has been adopted and is applied to all types of waste.



Waste Minimization/Pollution Prevention

LLNL is required by the UC Contract performance measures 1.2a and b to annually review its waste generation for P2 opportunities and to propose implementation projects. Previously, waste streams at LLNL were evaluated in terms of the total quantities of waste generated. However, the waste streams of greatest concern are not necessarily those having the largest volume. Each process that generates waste must be considered, as well as the individual characteristics of the components within each waste stream.

To better rank the waste streams and to improve the prioritization of waste minimization efforts, LLNL has developed a new, alternative, weighted ranking system. The methodology assigns to each waste stream three weighting factors in addition to a factor based on quantity of waste generated annually. The three additional weighting factors use the following criteria: cost, waste type (which includes compliance and liability considerations), and operational aspects (such as routine vs nonroutine). This is discussed in *Reassessment of LLNL Waste Generation for Calendar Year 1995* (Celeste 1995).

In general, the 20 waste stream components having the highest priority (ranked by summing the four weighting factors) are entirely different from the top 20 source codes ranked by quantity only. For example, transuranic waste (TRU)/TRU mixed and low-level wastes, which are problematic at LLNL, are now ranked as having the highest priority, though their relative quantities are somewhat low.

Routine waste generation by waste category, from 1990 through 1996, is shown in **Table 3-2**. The trend from 1990 on shows a dramatic reduction in all waste categories, which is the result of a proactive P2 program at LLNL.

Table 3-2. Waste generation totals, 1990 to 1996 (in tons).

Waste category	1990	1991	1992	1993	1994	1995	1996
Radioactive	441	267	296	307	188	143	101
Mixed	202	80	153	46	26	36	23
Hazardous	1880	1148	1200	740	510	368	351
Sanitary	2820	2295	2300	2379	2465	2246	2001
LLNL totals	5343	3790	3949	3472	3189	2793	2476

Table 3-3 presents the percent reductions for 1996 compared to 1995, the 1993 baseline, and 1990 for a historic perspective. Decreases in radioactive, mixed, and hazardous waste generation in 1996 have already met the 50% reduction goal for the performance measure.



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Table 3-3. Waste reduction, 1996.

Waste category	Reduction 1996 vs 1995 (%)	Reduction 1996 vs 1993 (%)	Reduction 1996 vs 1990 (%)
Radioactive	29.3	67.1	77.1
Mixed	36.9	50.7	88.8
Hazardous	2.4	51.4	80.9
Sanitary	10.9	15.9	29.0

Nonhazardous Solid Waste Minimization

In 1996, LLNL sent 6136 tons of nonhazardous waste, including routine and nonroutine, i.e., sanitary waste in the above tables, to a landfill. The routine portion was 2001 tons and the nonroutine portion was 4135 tons. The breakdown is shown in **Table 3-4**.

Table 3-4. Nonhazardous landfill totals (in tons) in 1996.

	1996 total
Routine	
Livermore compacted	1881
Site 300 compacted	27
Industrial (TWMS) ^(a)	93
Routine subtotal	2001
Nonroutine	
Construction demo	4109
Industrial (TWMS)	26
Nonroutine subtotal	4135
LLNL total	6136

^a TWMS is the acronym for the HWM's Total Waste Management System.

Diverted Waste

The total waste diverted from landfills in 1996 was 20,259 tons. This large increase from last year is due to the beneficial reuse of soil on site (9000 tons), soil that is used at the landfill for daily cover (3606 tons), and asphalt that is used for road base material at the landfill (4090 tons). The waste diversion summary is shown in **Table 3-5**.

For 1996, the total of the diverted waste and nonhazardous waste sent to landfill is $20,259 + 6136 = 26,395$ tons. The recycling rate for nonhazardous waste is calculated by dividing the diverted waste by the landfill and the diverted waste total. This results in a recycling rate of 77% for the nonhazardous waste for 1996. This far exceeds the DOE-stated goal of achieving a 33% recycling rate of nonhazardous waste by December 31, 1999.



For LLNL's UC contract, the goal is to reduce the routine nonhazardous (compactible and industrial) waste (2465 tons) by 33% by December 31, 1999. As shown in **Table 3-4**, LLNL reduced the routine, nonhazardous waste generated in 1996 by 19%, to 2001 tons.

Table 3-5. Waste diversion summary table for 1996.

Description	1995 total (tons)	Cumulative 1996 total (tons)
Paper recycling		
Unbaled	254	266
Paper, baled (classified)	116	56
Paper, subtotal	369	321
Asphalt	686	4090
Batteries	38	21
Wood	406	398
Metals, ferrous	1121	1837
Metals, nonferrous	181	193
Metals, copper	78	73
Cardboard	151	159
Compost	NA	37
Diverted soil		
Off-site daily cover	794	3606
On-site reuse	NA	9000
Diverted soil subtotal	794	12,606
Food	—	1
Magazines	4	3
Non-LLNL phone books	8	7
Newspaper	6	3
Tires, scrap	30	24
Trailers ^(a)	—	97
Toner cartridges	<1	6
HWM recycled materials	314	384
LLNL diversion total	4186	20,259

^a The recycled steel frames from trailer demolition were separately tracked after the third quarter of FY96.

LLNL has been required by California Law to reduce nonhazardous solid waste by 50% between 1990 and 2000. Significant reductions have already been achieved; this waste stream has been reduced by 30% since 1990.



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In fiscal year 1997, LLNL has been chosen to receive a National DOE P2 award for its achievements in solid waste recycling of construction and demolition debris.

Source Reduction and Pollution Prevention

The Laboratory surveyed its operations for opportunities related to source reduction and pollution prevention in 1995. Annually, effective as of fiscal year 1996, the Laboratory will continue to survey on-site operations for opportunities to eliminate, reduce, recover, or recycle potential pollutants to all media, including air, water, soil, sediments, and biota.

Toxic Reporting Inventory Information

At LLNL only one chemical, Freon 113 (also known as CFC 113), is tracked and reported as part of the Toxic Chemical Release Inventory (TRI) for CY1996. This reporting is required by the Emergency Planning and Community Right-to-Know Act (EPCRA). All other chemicals are in quantities below the threshold reporting levels or are in a form that does not require reporting.

Freon 113, a chlorofluorocarbon (CFC), is an ozone depleting substance whose consumption and production is slated for elimination by the year 2000. For this reason, the replacement and recycling of Freon 113 is a high priority at LLNL.

Additional Pollution Prevention Program Elements

Implementing Cost-Saving P2 Projects

Pollution Prevention Opportunity Assessments (PPOAs) are conducted before the implementation of P2 projects. The purpose of PPOAs is to characterize waste streams and identify those P2 options that can be cost effectively implemented. After a process has been selected for evaluation, the PPOA team contacts program personnel for a series of information gathering meetings, including walkthroughs, demonstrations, brainstorming sessions, and individual discussions. Included in the LLNL PPOA methodology is a return on investment (ROI) calculation and cost assessment of the options for all PPOAs. Results or recommendations are developed in cooperation with program personnel and are thus technically evaluated for cost, ROI, technical feasibility, and feasibility of implementation.

The DOE provides competitively allocated funding to P2 projects through the High ROI P2 Program. This program encourages proposals for the implementation of P2 projects that provide a high ROI through reducing waste and associated waste management



costs. LLNL participates in this program to obtain funding for cost-effective P2 implementation projects. Over \$2 million in High ROI projects have been proposed to DOE and to date LLNL has received over \$1.7 million in funding for these projects. LLNL additionally uses ROI calculations and estimates of project cost-effectiveness to prioritize P2 projects for resource allocation and implementation at the Laboratory.

Review of New Processes or Experiments

Many organizations at LLNL use a “front end” review process that applies to new programs, projects, or experiments that could have a significant impact on the environment. In this review process, the initial hazardous materials projected to be used are identified, and concentrations of both the starting materials and the wastes produced are estimated. The possibility for chemical substitution, process changes, and recycling is then addressed. If an opportunity for P2 is identified, Pollution Prevention Group (PPG) will assist the generator in the evaluation of options. Researchers and project managers are encouraged to implement alternatives that are less hazardous or nonhazardous.

In general, P2 activities are covered by the pertinent directorate’s P2 Plan. New activities are reviewed to identify possible P2 techniques. Projects and experiments performed by LLNL are evaluated for P2 opportunities. All personnel are encouraged to implement reasonable P2 opportunities that have been identified.

Design for Environment

Design for Environment (DfE) is a fairly nascent field, with a number of methodologies and definitions. In general, any means of accomplishing the goal of minimizing environmental life cycle impacts can be thought of as an element of DfE. The DfE concept involves developing an understanding of and consideration for minimizing environmental impact over the lifetime of a project, and mitigating potential environmental impacts by overlaying this understanding directly onto the design of the project. Federal facilities are now required, under Executive Order (EO) 12856, to apply life-cycle analysis and total cost accounting principles to the greatest extent practicable when estimating P2 opportunities. Both of these can be considered elements of a new federally funded facility. In addition, EO 12873 requires federal facilities to implement P2 by giving preference to the purchase of environmentally preferable products. In light of these developments, traditional methods and tools employed for management and accounting may not be sufficient or effective enough in and of themselves to meet the requirements of EO 12856.

The Pollution Prevention Group, in conjunction with the National Ignition Facility (NIF) project management, has undertaken a DfE evaluation of the opportunities within the



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NIF Project and has made recommendations for focused studies that might also have the most immediate impact in areas of greatest concern to project management (such as P2, environmental compliance, and cost). Approximately 20 potential study areas have been identified, and several are being actively pursued, including the development of cleaning concepts and identification of P2 opportunities during special equipment design.

Additionally, P2 measures that are technically and economically practicable are being considered in the design of the Site 300 Contained Firing Facility (CFF). Lists from architectural information exchanges and from P2 design documents are provided to the CFF design team for evaluation. The CFF project has an individual designated as the P2 coordinator for the project.

Implementing P2 Employee Training and Awareness Programs

P2 awareness information, which covers all disciplines, is disseminated in the following forums:

- New Employee–Contractor Orientation
- EST meetings
- LLNL's Waste Minimization Steering Committee
- Presentations to the Environmental subcommittee
- Employee participation at DOE's P2 conferences and workshops
- Facility walkthroughs
- Earth Day
- Energy Fair
- Posters and videos
- Individual or group training sessions with generators
- Presentations to waste management personnel
- EP0006, a required waste generator training class
- Documents such as the Waste Acceptance Criteria, PPG brochure, and PPG Web page.

P2 awareness is also promoted through *Newsline* (LLNL's weekly newspaper) articles and administrative memos. PPG has developed a Web site to electronically distribute P2 information and also prepares brochures that briefly describe the P2 program at LLNL.



PPG also conducts monthly reviews of the HWM's Total Waste Management System (TWMS) database. This database tracks waste generation, and it affords PPG the opportunity to identify potential problem waste streams for each directorate and address issues in real time.

Current Return on Investment Projects

Some of the PPOAs led to the preparation of High Return-on-Investment (ROI) P2 Project Proposals in 1996. The major ROIs that were completed or were ongoing in 1996 follow:

- Microwave Digestion Equipment—Installation of equipment for the analytical laboratory, to replace acid-digestion methods.
- Technical Information Department Digital Photography Equipment —Purchase of digital imaging components.
- Photomicrographs, Building 321—Purchase of electronic imaging system.
- Ultra-High Vacuum—Removal of low-particulate contamination for ultra-high vacuum and clean room applications with nonhazardous solvents.
- Digital Acquisition System—Purchase of electronic imaging system for the transmission electron microscope.
- Nondestructive Analysis Waste Sampling—Purchase of equipment for field analyses and development of methods to reduce number of samples collected.
- High Explosives Water Recycling System—Installation of waste water recycling systems for Site 300.
- Uranium Cutting Tools—Purchase of equipment and development of methods to produce high-quality machine cutting tools capable of dry machining materials.

ChemTrack

ChemTrack, a computerized chemical inventory system, is an important tool for ensuring compliance with SARA Title III and California Business Plan reporting requirements, and for improving the overall management of hazardous materials at LLNL. ChemTrack tracks chemical inventories at LLNL through the use of bar codes, laser scanners, and customized software and enhances LLNL's ability to obtain the toxic release information necessary to complete SARA 313 submittals. With the addition of



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new, hand-held bar code scanners, the 1996 inventory was the most accurate and most efficient to date. It is expected that these new scanners, with revised software, will continue to significantly improve inventory accuracy while reducing operating costs over the next 2 years. ChemTrack currently has an inventory of approximately 185,000 chemical containers ranging from 210-L drums to gram-quantity vials.

In addition, ChemTrack includes a chemical locating service that allows LLNL researchers to find and share chemicals. This minimizes the purchase of new chemicals, thereby reducing procurement costs and the generation of hazardous waste. Also, ChemTrack data is being used by various LLNL organizations to improve emergency response planning and management of Material Data Safety Sheets (MSDSs), to more closely track specific high-hazard chemicals and other regulated substances, and as a screening tool for conducting preliminary hazard analyses of selected LLNL facilities.

Current Issues and Actions

Many current issues and actions are described in this report according to chapter subjects. This section lists several not covered elsewhere.

Miniature Optical Lair Explorer

In 1994, the Operations and Regulatory Affairs Division (ORAD) developed and began using the Miniature Optical Lair Explorer (MOLE) to perform biological assessment studies at Site 300. The MOLE is a miniature tracked vehicle with a tiny camera that allows scientists to investigate subterranean tunnel systems of special-status wildlife species to determine animal presence and numbers. At LLNL, surveys for the San Joaquin kit fox, burrowing owl, and American badger are done before startup of ground-disturbing activities in order to ensure their protection, if present.

The MOLE was used successfully at LLNL in 1996 to survey for the presence of several special-status species with subterranean habits: the burrowing owl, American badger, California tiger salamander, and California red-legged frog. In addition, the MOLE was taken by an international environmental assessment team to Lake Baikal, Siberia, to help evaluate the health of the area's ecosystem. Further studies are projected for fiscal year 1998.

In 1996, improvements were made to the MOLE, including an infrared lighting system for more effective surveillance, a backpack design for versatility and field handling efficiency, and improved monitor resolution. Further development and use of the MOLE will continue in 1997.



Leaking Underground Fuel Tank Studies

In 1995, LLNL led a team of researchers from LLNL and four University of California campuses in a collaborative study of underground contamination from leaking underground fuel tanks (LUFTs). The study, performed for the California State Water Resources Control Board (SWRCB), found that once fuel leak sources have been removed, fuel contamination generally does not spread far from the leak site. Given time, naturally occurring microbes in the soil and ground water will usually break down most of the pollutants before they can reach a source of drinking water. On the basis of this study, the SWRCB is revising its overall ground water cleanup policy, ranking cleanup sites by their risk to drinking water sources, and selecting appropriate cleanup techniques based on risk.

One of the important recommendations of the study was to identify a series of LUFT demonstration sites and to form a panel of experts made up of scientific professionals from universities, private industry, and federal and state regulatory agencies. This panel would provide professional interpretations and recommendations regarding LUFT evaluations and closures at demonstration sites.

As a result of this recommendation, ten Department of Defense (DoD) sites were selected in 1996. Site selection was coordinated through the California Military Environmental Coordination Committee Water Process Action Team. Sites were selected to represent each branch of the military services with bases in California, as well as a number of Regional Water Quality Control Boards (RWQCBs) and the diverse hydrogeologic settings in California where fuel hydrocarbon contaminant cleanup problems occur. The sites selected and their corresponding RWQCB regions are: Army Presidio at San Francisco, San Francisco RWQCB; Barstow Marine Corps Logistic Center, Lahontan RWQCB; Camp Pendleton Marine Corps Base, San Diego RWQCB; Castle Air Force Base, Central Valley RWQCB; China Lake Naval Weapons Center, Lahontan RWQCB; El Toro Marine Corps Air Station, San Diego RWQCB; George Air Force Base, Lahontan RWQCB; Port Hueneme Naval Construction Battalion Center, Los Angeles RWQCB; Travis Air Force Base, San Francisco RWQCB; and Vandenberg Air Force Base, Central Coast RWQCB.

Recommendations will be made by the Expert Oversight Panel formed as part of the demonstration project for an appropriate risk-management strategy at each site and the set of actions needed to achieve site closure, based on the concept of developing conceptual models that identify potential hazards associated with sources, pathways, and receptors. The recommendations will also include site-specific findings regarding natural attenuation potential and discussion with regulators.



3

Environmental Program Information

Initiative to Improve VOC Cleanup Process by Using Historical Case Analysis

The goal of this initiative is a nationwide historical case evaluation that uses a large number of cases to identify common volatile organic compound (VOC) release conditions that pose low risks and can be managed with minimal effort and cost, versus release conditions that pose higher risks and warrant larger expenditures of money. The key to this initiative is a cross-cutting evaluation of the large amount of VOC case data that is available.

As part of this initiative, two groups have been formed: a Working Task Force (WTF) and a Peer Review Panel (PeerRP). The WTF will focus on technical issues of historical VOC case data collection and analysis as well as preparing draft findings and conclusions based on the data analysis. The PeerRP will be called upon to review key deliverables; raise technical issues; and review and comment on draft findings, conclusions, and any recommendations. WTF includes members from the DOE, DoD U.S. Navy and Air Force, U.S. EPA, California Regional Water Quality Control Boards, and the Western Governors Association Working Group on Interstate Technology and Regulatory Cooperation.

Data collection has begun, and the PeerRP and WTF are formed and are meeting regularly. Data collection should be complete by August 1997, findings and conclusions should be prepared by December 1997, and recommendations should be prepared by March 1998.

Cal/EPA Environmental Technology Certification Program

In 1995, the California Environmental Protection Agency (Cal/EPA), through the Department of Toxic Substances Control (DTSC), contracted with LLNL to provide performance evaluations for its hazardous waste environmental technology certification program. The program was created for two principal reasons: to simplify and expedite the permitting of new technologies for cleanup in California and to assist California environmental companies in selling their products and services. DTSC is looking toward LLNL as a source of scientific expertise in certain technical areas to (1) evaluate and verify a proponent's technology, and (2) provide peer review evaluation reports. The LLNL site is also available for private companies to test their technologies for certification.

DTSC reviews each vendor application to determine whether the technology is ready to be certified and estimates the cost of certification. Then DTSC collects the fee from the vendor, selects members and a chairperson for the teams, and organizes the evaluation and peer review efforts.



Two technologies, a field immunoassay system for polynuclear aromatic hydrocarbons and a zinc-manganese rechargeable battery, were evaluated by LLNL in 1995. During 1996, LLNL began evaluations on two more technologies. The first of these is the development of criteria for certification of cleaners and cleaning systems that are alternatives to chlorinated solvents. The second technology is a passive soil vapor survey technology.

Spill Reporting

The federal government and the State of California have several distinct statutory and regulatory provisions that require responsible persons to report releases or threatened releases of hazardous materials or pollutants into the environment. DOE has also established various Orders that require reporting of incidents to DOE Headquarters. These provisions have varying requirements regarding the types of releases that must be reported, the timing of the report or notification (immediate and follow-up), the content of the report (e.g., source of the release, nature of the material, and the quantity released), and the particular agencies that must be notified. Many releases must be reported under more than one provision, and compliance with one provision will not necessarily satisfy another applicable provision.

Under authority of the *San Francisco Bay Water Quality Control Plan*, the San Francisco Bay RWQCB requires a report of all releases to the ground or surface waters that are not specifically allowed in permits. LLNL followed a reporting procedure established by the San Francisco Bay RWQCB that identifies the types of spills that must be reported, and specifies when the spills are considered to be of so little consequence that records can be kept on file and noted in the routine quarterly reports. If a spill of a reportable quantity of material occurs or the material is not contained, the appropriate agencies are contacted immediately.

Response to Spills and Other Environmental Emergencies

All spills and leaks (releases) that are potentially hazardous to the environment are investigated and evaluated. The release response process includes identifying the release, shutting off the source (if safe to do so), eliminating ignition sources, contacting appropriate emergency personnel, cordoning off the area containing the released material, absorbing and neutralizing the released material, assisting in cleanup, determining if a release must be reported to regulatory agencies, and verifying that cleanup (including decontaminating and replenishing spill equipment) is complete. Environmental analysts provide guidance to the programs on preventing spill recurrence.



3

Environmental Program Information

To maximize efficient and effective emergency environmental response, EPD established a 7-days-a-week, 24-hours-a-day, on-call rotational position entitled the Environmental Duty Officer (EDO). Specialized EDO training includes simulated accidents to provide the staff with the experience of working together to resolve environmental issues within the regulatory structure. The on-duty EDO can be reached by pager or cellular phone at any time.

During normal work hours, Laboratory employees report all environmental incidents to the Environmental Operations Group (EOG) environmental analyst assigned to support their program area. The EOG environmental analyst then notifies the on-duty EDO of the incident and together they determine applicable reporting requirements to local, state, and federal regulatory agencies and to the DOE. The EDO and the EOG environmental analyst also notify and consult with program management, and have 7-days-a-week, 24-hours-a-day access to the office of Laboratory Counsel for questions concerning regulatory reporting requirements.

During off-hours, Laboratory employees report all environmental incidents to the Fire Dispatcher, who, in turn, notifies the EDO and possibly the Fire Department. The EDO then calls out additional EPD support to the incident scene as necessary, and follows the same procedures as outlined above for normal work hours.

Environmental Training

Major efforts are ongoing to provide LLNL employees with training on environmental topics aimed at improved compliance. Training tasks address both specialized training for environmental professionals and training in a variety of environmental topics for employees at all levels throughout LLNL. Courses presented by EPD's Training Section are listed in **Table 3-6**.

LLNL's Other Environmental Programs

Integral to LLNL's environmental research is the Environmental Programs Directorate that conducts multidisciplinary research to assess and mitigate environmental and human risk from natural and man-made hazards and to develop and demonstrate new tools and technologies for environmental restoration. This work includes studies in the design, analysis, and testing of advanced waste-treatment technologies; *in-situ* environmental remediation using natural and engineered processes; pathway, dosimetry, and risk analysis of radioactive and toxic substances; atmospheric dynamics; subsurface imaging and characterization; and seismic processes.

**Table 3-6.** EPD training courses.

Administrative Operations Pollution Prevention	Air Source Management
Diversity Training	Environmental Duty Officer Briefings
Environmental Law and Regulation	New Hire Orientation
Waste Retention Tank Management	Petroleum Product Storage Tank Management
Hazardous Waste Generation and Certification	Hazardous Waste Sampling
Hazardous Waste Transportation	Identification of Hazardous Material
Hazardous Waste Generation and Certification Review	Land Disposal Restriction
Low-Level Waste Certification Overview	Low-Level Waste Generation and Certification
Spill Prevention, Control and Countermeasure Training	Marking of Packages
Overview of Environmental Law and Regulation	Packaging Operations
Placarding: Hazardous Waste Transport	Pollution Prevention for Facility Design
Radioactive Materials	RCRA Facility Management
RCRA Operations	Waste Disposal Requisition Training
SWPP	SARA/OSHA Refresher Training
National Environmental Policy Act (NEPA) Compliance	SARA/OSHA Training 40 Hour
Separation for Highway Transport	Shipping Papers
TRU Waste Generation and Certification	Waste Management Unit Inspection, Procedures, and Emergency Response
Waste Accumulation Area Operations	

While EPD plays a central role, every directorate at LLNL is responsible for environmental compliance and minimizing the impacts of its operations. Several directorates have taken particularly noteworthy steps in this direction. These include the plans for Defense Nuclear Technologies Program's Contained Firing Facility at Site 300 that will move explosive tests inside a facility where the debris is contained, the Laser Program's efforts to design the National Ignition Facility to have minimal environmental impact, Engineering's Metal Finishing Group's efforts to reduce waste and substitute less hazardous chemicals in many of their processes, and Education Program's efforts to enhance environmental education.

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